SCIENCE.—SUPPLEMENT.

FRIDAY, OCTOBER 30, 1885.

MASSACHUSETTS LABOR STATISTICS.

THE sixteenth annual report of the Massachusetts bureau of labor statistics offers a good example of the modern method of treating social questions. It aims to establish the conduct of the commonwealth toward the laboring class on facts and safely drawn conclusions, not on theories and speculations. It is perhaps the most typical fact in the modern aspect of the state toward the workingman, that there exist bureaus of labor statistics.

A very painstaking piece of work is the tabulation of 'Wages and prices' from 1752 to 1860 in this country. The tables give (1) the price for each year of the staple articles, (2) the price of these articles from year to year, and (3) a convenient summary of the changes in prices by periods of about ten years. The value of these tables must depend largely on their great usefulness to future work in this direction. They form the text from which quite a various number of lessons may be read.

The industrial history of the country may be made to fall into three periods.

(1) The early industrial period, previous to about 1815. This period serves as a background from which future prosperity stands out the more boldly. It is a period of hand labor; of few industries; of no specialization—each artisan going through the whole series of processes of his craft; with little money, so that barter was a great factor in the mechanism of exchange; with little education for the workingman, and a more absolute control of his welfare in the hands of the employer, who not seldom took an undue advantage of his position.

(2) The period of transition (1815–1830), characterized by a gradual dissolution of the old and a gradual adoption of the new; from which finally resulted

(3) *The present period.* The first great fact which stamps this period is the development of invention. New forces were employed and labor saved; natural products were adapted to serve human wants, and waste utilized. From 1841 to 45, 3547 patents for inventions were issued; in 1856–60, 18,479. In 1855 an annual product of one million dollars (in 1875 of three million), was made by the rubber interest of Massachusetts, which thirty years before was mere waste caoutchouc gum. Specialization completely transformed the methods of labor. Each man makes one thing alone; by this means his share of the amount produced is enormously increased. In 1855 each operator in a shoe factory (under the old *régime*) produced 455 pairs of shoes; in 1875, 1205 pairs; while the average wages have risen from $205 per year to $397, and the actual time of employment has decreased 12 per cent. The introduction of machinery utilizes ignorant labor, and does not create it, as is often supposed. The lowest industrial class is thus raised in the social scale. The daughters of American farmers and mechanics were formerly the operators. Now skilled labor is not required. Accordingly their places are taken by a more ignorant class, while they move upward to higher callings, in which their entire mode of life is better than that of their predecessors.

A second great difference between the present period and its forerunners, is the change in the status of the laborer before the law. The government now limits the hours of work, prevents the employment of minors, abolishes imprisonment for debt, exempts the workman's tools from attachment, provides fire-escapes, authorizes co-operative associations, extends the benefits of free education, and much besides. The "difference in scale of living between the employer class and the laborer of the early period was far less than that between the workman of to-day and his predecessor." The tables tell the same story. The general tendency, broken only by temporary fluctuations, has been toward a rise in wages. The workingman of to-day is paid better, has more time to himself, and, in many cases, has even an increasing share of the net product of his labor. Prices, however, have advanced, and the final question is, have the wages increased more than the prices? The general increase in the wages, as shown by comparing the periods ending 1880 and 1860, is 52%, while the increase in prices averages 13%. Since 1860 the Massachusetts workmen may be said to have gained a 'pecuniary betterment' of over 10%.

In the last paragraph we reached the true test of the welfare of the workman: the relation between wages and prices. To this question, the essay on the 'comparative wages and prices' in Massachusetts and Great Britain, from 1860–83, is a valuable contribution. This essay is a condensation of three previous reports by the labor bureau,

and gives the whole matter in a concise and useful shape.

In the first investigation 24 industries were compared; and the average of different modes of computation leads to the result that, in general, wages are 62% higher in Massachusetts than in Great Britain. In those cases where pay-rolls could be compared, the average weekly pay was $10.82 in Massachusetts, and $5.48 in Great Britain. We must remember, however, that the number of working hours is 12% greater in Massachusetts. The average wages per hour show a gain of 71% in favor of Massachusetts. Women's wages, as also those of young persons and children, show a gain of 59% in favor of Massachusetts. The next investigation covered 90 industries, and considers the wages of at least 1,250,000 of employés. The wages in Massachusetts are 77% higher than in Great Britain. Besides wages have increased since 1860 in Massachusetts by 28%, in Great Britain by 10% since 1872.

The other side of the question is represented by the cost of living. Our sources of information are prices and workingmen's budgets of expenditure. Prices are higher in Massachusetts (for everything except provisions) on an average of 43%. The average family in Great Britain is slightly larger, but a slightly larger proportion of the family are at work, thus making a direct comparison with the Massachusetts family perfectly fair. In Massachusetts the earnings per family are 55% higher than in Great Britain; the former saves 6%, and the latter 2%, of its income. The expenditures for 1883 of the two families are $754 and $508. If we consider the articles of expenditure, we shall find a remarkable harmony with an economic law demonstrated by Dr. Engel (Royal statistician at Berlin). This law says, 1. the greater the income, the smaller the relative percentage of outlay for subsistence; 2. the outlay for clothing remains uniform, as also; 3. does that for lodging, rent, fuel, light; 4. the outlay for 'sundries' becomes greater as the income increases. The agreement between the calculated and actual values for each item of the expense is very close, the average deviation being less than 3%. The table further teaches that the prices of articles entering into the cost of living were 17% higher in Massachusetts in 1883; of this 11% is due to higher rents in Massachusetts, leaving 6% as indicative of the higher cost of living in Massachusetts. As a final conclusion we have that the standard of living of Massachusetts workingmen to that of the workingmen of Great Britain is as 1.42 to 1. That is, while the cost of living is higher, the wages are still so much higher than those in Great Britain as to leave a margin for better living and even greater saving.

Another portion of the volume deals with the problem of Sunday labor. The questions are these: Has the Sabbath become a necessary element in modern industry, and is its absolution connected with serious evils or not? The departments in which Sunday labor is done are considered one by one. By far the greatest share of Sunday labor is done in connection with railroading. All the roads began without Sunday labor, but street cars and steam railways alike were forced to Sunday labor by public demand. The trains are run for convenience rather than for profit. While the employés generally declare that they would rather have the day of leisure than the additional wages, still the usual effects of overwork seldom occur. The important consideration is this: Sunday labor is not productive labor, but is labor for personal service, and such occupations do not call for constant exertion. If the weaver had to stand at his loom for seven days of the week, he would probably break down; but the car-conductor does it without physical deterioration. The proportion of Sunday laborers to the laboring community is probably larger than one would suppose, 32% of working females and 11% of males doing work on that day.

THE ASCENT OF POPOCATAPETL.[1]

DURING the conquest of Mexico by Cortez, some of his followers ascended this volcano to obtain sulphur with which to renew their exhausted supply of powder. The ascension of Popocatapetl, as compared with that of other great mountains of the world, presents no unusual difficulties, and in the course of the present century, many parties have accomplished it with entire safety, especially since the attention of the commercial world has been called to the great value of the sulphur deposits there.

The ascent is always undertaken from the northwest side of the mountain, starting from the town of Amecameca, which lies on the railroad from Mexico to Morelos. From here a horseback ride of three or four hours brings the traveller to the rancho Tlamacas, just below the snow-line, and from this point the ascent is continued on foot. The party is provided with alpenstocks, and a sort of primitive sandals called *guaraches*, drawn on over the boots to prevent slipping. A peon goes ahead and hews steps in the hard-frozen snow; the others follow in Indian file, pausing every now and then to rest, as the exertion in the extremely rarefied atmosphere is very exhausting.

After the summit is reached, the view, if the

[1] Condensed from an article by Carlos von Gagern, in the *Deutsche rundschau für geographie und statistik*.

weather is clear, amply compensates for all the difficulties of the ascent. At the feet of the spectator lies spread out like a map the beautiful plateau of Anahuac, over eighty miles long, with its four lakes, and more than 200 cities, villages and haciendas, including Mexico the capital, Puebla, Cholula, Atlixco and Tlaxcala, surrounded by snow-covered mountains, among which rise the peaks of Ixtaccihuatl, only eight miles distant, Malinche, and farther toward the east, Orizaba.

The view of the interior of the crater is always completely obscured by the sulphur vapor, which constantly rises from the openings in the bottom, called *respiraderos*. It is at first of a greenish color, then condenses and falls in yellow drops, and finally forms into beautiful crystals. The edge of the crater is composed of immense blocks of porphyry and basalt. To descend into the crater, one follows a path leading downwards from the summit among ice-covered rocks, till a huge block of basalt is reached, which serves as a support for the primitive machine, called *malacate*, which is used here, as in most of the mines of Mexico, for the perpendicular descent of the remaining distance. A strong beam projects a few feet horizontally over the abyss; over a pulley in the end runs a long rope with a loop in the lower end. The person wishing to descend stands in the loop, holds the rope in one hand, and with the other manages a stick, to protect himself from injury by swinging against the rocks. Two peons let the rope run slowly out over the pulley, and in this way the descent is accomplished. The rope is over 250 feet long, and the descent occupies ten or fifteen minutes.

The crater has the form of a funnel. The bottom is composed of scoriæ, which glitter with various colors, and among which are the *respiraderos*. In one place is a stone so large that a man can stand upon it, which rises and falls as it feels the effect of the subterranean vapors. At the lowest point is a lake, the water of which has a sulphurous and also somewhat acid taste.

The descent of the mountain is, of course, very much easier and quicker than the ascent; that of the snow-cone especially is accomplished in a very summary manner, familiar enough to a New Englander, to be sure, but rather startling in its novelty to inhabitants of the southern countries. An Indian sits on the forward end of a mat, holding a stick upright between his legs; the traveller sits behind, clinging to the guide with hands and legs, and in less time than fifteen minutes the distance is traversed, which in the ascent occupied three or four hours.

According to the latest measurements, the height of Popocatapetl is 17,809 feet above the sea-level. The crater is about 2¼ miles in circuit, and has a depth of 1,000 feet. Since the mountain has given out sulphurous vapors for centuries, and at the present time something like a ton of sulphur is deposited daily, the amount of the mineral existing there is almost beyond estimation. It would hardly be an exaggeration to say that the upper part of the mountain is an immense block of sulphur, enclosed in a shell of rock a few yards thick.

Three qualities of sulphur are obtained by the operations here. The best is almost chemically pure, obtained at the *respiraderos*, whence it issues in a liquid state and hardens as it cools. The other two qualities are known as rich and poor sulphur-ore. The former yields from 82 to 87 per cent of pure sulphur, the latter about 50.

The process used for the purification of the sulphur is that of Michel, with the apparatus improved by Lamy. The distillation takes place in six large cast-iron kettles, or half-cylinders, which take the place of retorts, and a large brick chamber which serves as the receiver.

Since the sulphur of Popocatapetl is much superior to the Sicilian, it is in greater demand in the American markets. The works at Tlamacas have control of enough water and fuel to increase their productiveness considerably. This would be in every respect advantageous; aside from the consumption of Mexico, the United States use 200,000 tons annually, and even if every ton were sold 20 per cent below the usual price, there would still be, after allowing for freight and all other expenses, a clear profit of two dollars a ton. The expenses of production are very small. The workmen receive only about 75 cents per *arroba* (25 pounds), although their work is laborious, dangerous on account of the constantly falling rocks, and from breathing the sulphurous vapors very deleterious to the health, causing in a short time, among other inconvenience, the falling out of the teeth.

The principal source of the world's supply of sulphur at present is Sicily, which produces four-fifths of that consumed. The deposits of Popocatapetl are greater than those of Sicily, and, as already stated, of better quality. It seems incredible that they have not been more thoroughly worked, especially as this sulphur can be brought to market 25 per cent cheaper than the Sicilian, at least in the United States.

A plan is now on foot to lead a tunnel through the wall of the crater directly to the sulphur deposits, and connect its mouth by a narrow-gauge railroad with Amecameca, which is on one

of the main lines of the country. The capital is forthcoming, and it is quite likely that in a few years this mountain, which is of such great interest in geologic, topographic, and artistic respects, will have acquired an almost incalculable industrial importance.

NATURAL ENEMIES OF OYSTERS.

Man in former times, and even at present in some localities, might be classed with the enemies of the oyster. But now, when he is introducing artificial means for their multiplication, instead of an enemy he becomes their protector. There are animals, harmless-looking and small, which do far more damage to this delicious shell-fish than man, and that, too, without giving anything in return. The many which are destroyed by human agency become few when compared to those killed by their smaller foes.

The oyster, although protected by a very hard shell that can be closed almost hermetically, is, on the whole, rather poorly defended, for there he lies right on the open bottom, exposed to everything that may chance to come along, without any power to move away and crawl into some crevice, but destined to remain motionless while attacked. Two kinds of animals do the most damage: one the common star-fish (Asterias Forbesii), the other a univalve spiral shell-fish, called by oystermen the 'drill' (Eurosalpinx cinerea).

A star-fish approaches its victim, slowly crawls upon it, and then bends its five arms around the shell. The mouth of a star fish is so small that an oyster a quarter of an inch long could not be taken into it. So what does it do, when its arms are encircled around the large oyster, but begin to project its stomach out of its mouth and surround the oyster with its stomach entirely outside of the body. Then the oyster gradually opens its shell, leaving the star-fish to do as it pleases. After a while the star-fish moves off, and we see that a large part of the oyster is gone. When the stomach is first protruded a liquid is excreted which seems to have the power of either killing or weakening the oyster. Just as soon as the shells are open digestion is begun by the star-fish, and after a short time the hunger of the star-fish is satisfied and the oyster is dead. Before long the star-fish feels like another meal, and he attacks another oyster, leaving the old one as prey to small crabs and shrimp. And so it goes on day after day, thousands operating in the same manner. At times they come in immense swarms from deeper water, in a single night entirely destroying a large bed. In brackish water they do not flourish, but in the almost pure ocean water found in some oyster-raising districts the destruction is immense, and there is no remedy.

If some shell-fish for which the star-fish have a preference could be introduced among the oysters, perhaps the devastation might be partially checked. Oystermen formerly had the stupid habit of tearing every star-fish that happened to come in their way into pieces, throwing the fragments overboard. They were not aware that each arm had the power of reproducing the remaining four arms and becoming a perfect star, so that each time one was torn into two or three pieces, two or three new individuals were formed.

The other enemy, the so-called 'drill,' is well named, for its peculiar operations are based upon its boring or drilling powers. Although seldom an inch long, it can bore a hole through the hard shell of an oyster with surprising speed. The hole is always smooth and about in the same place, a spot covering a vital part being the point attacked. Similar 'drills' operate on other species of shell-fish, and their deadly marks can be seen on the valves of the shells which are washed upon our beaches. In any collection of shells, and on any beach, numerous examples of the neatly-drilled hole can be found.

In the soft animal part of the 'drill' there is a little tube-like proboscis which encloses another proboscis. Over the end of the latter there runs a little ribbon which is covered with teeth. This ribbon, or odontophore, is attached at each end on the two opposite sides of the inner proboscis. By means of muscles at the base of each end of the ribbon it may be pulled back and forth over the end of the snout, with the teeth projecting outward. When the oyster is to be attacked, the end of the snout is pressed against that part of the shell to be bored, and the muscles begin to work the toothed strap. The teeth rasp away at the shell, each time removing particles of calcareous matter until a hole is bored. Then the rasp acts upon the flesh inside, and as the meat is removed it is drawn to the mouth and eaten.

The 'drill,' after eating a meal, leaves its victim, and later attacks another. By the time it has finished its meal the oyster is dead, and its shell flies open, leaving the rest to crabs and shrimp. Filing away upon the hard shell wears the teeth away rapidly, but this is remedied by nature, for one end of the strap is gradually absorbed, while from the other end a new supply of toothed ribbon is being formed. So, on one side of the proboscis, there are fresh unused teeth; on the other side, old worn ones; and on the end, teeth just being worn; and the whole gradually moving away to one end, to be absorbed while other fresh ones are being formed.

Ralph S. Tarr.

THE ACTION OF COLD ON MICROPHYTES.[1]

PROFESSOR MCKENDRICK, of Glasgow, gave at the recent meeting of the British association an interesting account of the methods of trying to destroy small organisms like bacteria, not as is commonly done by heat, but by cold. It is known that by means of Coleman's cooling machine meat may be kept from putrefying for a considerable time, but in attempting to sterilize a putrescible solution by means of cold, it was found that, though in some cases putrescence was delayed, in no case were the organisms completely destroyed. Organic fluids were exposed to temperatures more than 120° below 0° F., but on thawing they were found to contain living organisms still. Thus the hope of preserving putrescible matter by means of cold—an important economical result—is, so far as investigation yet goes, destroyed. The organisms under cold seem to be in a nearly solid state, though we cannot call it a chrystalline state. In a paste solution the water is chrystallized under cold, the paste remaining spongy. Possibly cold may separate from these minute organisms the water they contain, and this water is again absorbed on thawing. Meat under cold becomes very friable, while yet minute fragments of it show the same microscopic constitution of muscle. It is well known that frogs have been found in blocks of ice and been revived. Frogs have been frozen at 20° F. in about half an hour. On thawing slowly, the animal, in two instances, completely recovered. When it was frozen for longer than half an hour it did not recover; but, though reflex action was gone, there remained some irritability both in nerves and muscles. It was found also that certain vital functions may be arrested by cold, and thus conceivably higher organisms may be kept vitally inert for an indefinite time. Experiments were also tried on warm-blooded animals. A rabbit subjected to a temperature 100° below 0° F. recovered. No temperature lower than 73° below 0° F. has been obtained in free atmosphere.

PRELIMINARY REPORT OF THE COMMISSION APPOINTED TO REPORT ON THE SPANISH EARTHQUAKES.

THE commission appointed by the Spanish government to investigate the Andalusian earthquake of December 25, 1884, has made a preliminary report of its labors and conclusions up to March 7, 1885 (*Terremotos de Andalucía*, Madrid, 1885, 107 p.). This report is based upon a personal examination, which the members of the commission made of the region affected, and upon some thousands of answers received in response to a series of interrogations which were widely distributed. A more detailed discussion of their work is to follow at a later date. This report, however, deals quite fully with the matter in hand, and states conclusions which, although often only negative, are yet of considerable interest. We must be content with presenting here a brief *résumé* of its contents.

Beginning with a statement in seven pages of the theories proposed by various writers to account for earthquakes, classifying them as volcanic or non-volcanic, and attributing them to the internal heat of the earth, to the presence of vapors of high tension, or to the solution of the rocks by subterranean waters; it proceeds to give in seven pages more a description of the orography and hydrography of the two provinces of Granada and Malaga, and then devotes twenty-one pages to the geology of the same district, describing in detail the rock formation, with the location and direction of its principal fault lines.

Coming to the present occasion, a brief discussion of the times observed at different places leads only to the conclusion that the origin is to be sought to the west of Granada and east of Malaga, any exact result being vitiated by the uncertainty of the time data; this being due to the lack of good clocks and to the fact that, in places where much damage occurred, the attention of the inhabitants was pretty thoroughly occupied with caring for their own safety. The area affected is described as limited toward the north by Madrid and Segovia, toward the west by Cáceres and Huelva, toward the east by Valencia and Murcia, and on the south by the Mediterranean; but the tremor of the earth was also indicated by instruments even so far distant as Rome and Brussels. Examination of the direction of the cracks in the ground and in buildings, as well as of the curves of intensity, estimated according to the Rossi-Forel scale, leads to the conclusion that the focus is to be found in the valley of Zafarraya, where the greatest damage was caused.

The latter half of the report is mostly occupied with the phenomena preceding, accompanying, and following the earthquake, such as, changes in the course of streams, perturbations of magnetic apparatus, barometric depression preceding the shock, subterranean noises, dynamic effects, etc. In estimating the amount of damage done, the number of buildings injured in the two provinces of Granada and Malaga is stated as 17,178, of which number 4,399 are classed as totally destroyed. The injured persons were: 745 dead, 1,485 wounded. In discussing the causes of this earthquake, the commission accepts the Italian

[1] From *Nature*.

theories, attributing the earthquake to the tension of vapor of water in the subjacent strata. The valley of Zafarraya, indicated above as the probable focus, is a locality where much water gathers and easily penetrates beneath the surface, and to the vapor of high tension produced from the water here collected in deep-lying strata are attributed the forces which gave rise to the present earthquake. It is assumed that in general the lines of seismic propagation, following crevices in the strata beneath the surface, will accord with the direction of the surface water courses. On this idea, the principal radiant lines from Zafarraya were along the rivers Marchau and Genil; a view which is regarded as confirmed by the phenomena in the Sierras Tejeda, Marchamonas, and Eumedio, where large crevasses occurred parallel to the direction here indicated. In the province of Malaga the principal seismic effects were found in the vicinity of Periana, adjoining the district designated as the focus, but on the other side of the sierra, which separates the two provinces, and here the principal radiant line followed the course of the river Velez.

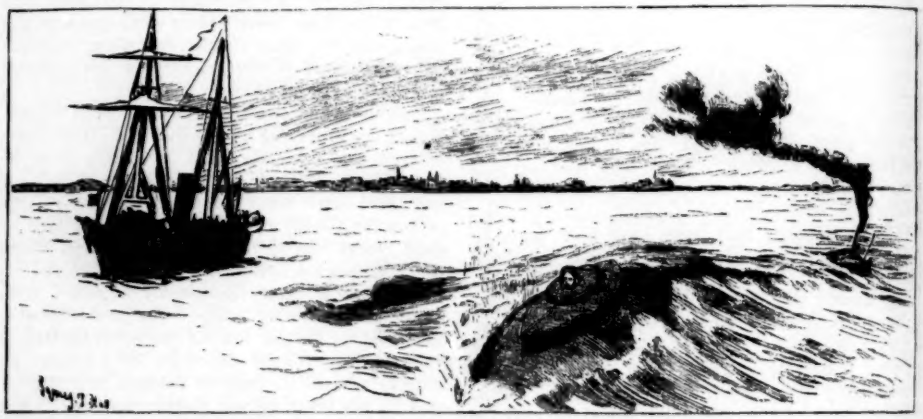
Theoretical considerations suggesting that the area affected should approximate in form to an ellipse, this is found to agree with the observations; but the data at hand do not suffice for any exact determination of the direction and velocity of the movment, nor of the depth of the focus.

In conclusion, then, the report fixes upon Zafarraya as the focus of this earthquake, and suggests a probable cause for it in the subterranean waters gathered there; but more exact results are yet wanting, and may very likely remain so, even when the fuller report is issued. This, however, will be awaited with interest, and will doubtless contain valuable additions to the science of seismology.

The report is signed by Manuel Fernandez de Castro, Juan Pablo Lasala, Daniel de Cortázar, and Joaquin Gonzalo y Tarin.

THE NORDENFELT SUBMARINE BOAT.[1]

Just before leaving Denmark for the south, the Prince of Wales, with the King and Queen of Denmark and the Czarina, witnessed off Landskrona, a town on the Swedish coast, an interesting and successful trial of the new submarine boat, which has been built at Stockholm upon the plans of Mr. Nordenfelt, the inventor of the machine gun so extensively used in modern warfare. Ever



THE TRIAL OF THE NORDENFELT SUBMARINE BOAT AT LANDSKRONA, SWEDEN.

since the American civil war, naval engineers have been striving to solve the problem of submarine navigation, but until now with very little success. Mr. Nordenfelt's invention, however, appears to fulfill the numerous requirements necessary for overcoming the difficulties and dangers of maintaining, driving and directing a boat beneath the water. The boat is built of steel, and is cigar-shaped, with a glass conning-tower in the centre, from which the commander can keep a look-out. This dome is protected by a strong iron cover. There are three engines, one to work the screw in the stern which propels the vessel, and two to work the propellers on either side, which, when set in motion, compel the boat to sink, and maintain her at a certain depth beneath the surface. When it is wished to sink the boat, enough seawater is taken in to reduce the buoyancy till the

[1] From the London *Graphic*.

tower is just above the surface. The side propellers being then set in motion, the vessel can be sunk to any required depth, there being an automatic arrangement by which the engines are stopped directly that depth is exceeded. An automatic horizontal steering gear also prevents the boat from going down or up headforemost, an even keel being preserved throughout all the manœuvres. Should a breakdown of the engine occur, the boat from its own buoyancy at once rises to the surface. The motive power is steam, and as long as the vessel is above water the fires can be stoked, the smoke being driven through two channels, which pass partly round the hull and point aft. When, however, the boat sinks, the fires have to be sealed, and reserve steam is used, which is kept at high pressure in two tanks. With this the boat has been driven for five hours at a speed of three miles an hour. Her speed on the surface is eight knots. The crew numbers three, and during their submarine existence, they have to subsist on the amount of air which they take with them in the hull, in which four men have subsisted for six hours without any especial inconvenience. The boat is sixty-four feet long, and the central diameter is nine feet. The enormous utility of such a vessel as this in naval warfare is at once apparent. Moving without the slightest apparent sign of existence, she can launch torpedoes against hostile vessels, enter a harbor unperceived, and render useless the most complicated system of submarine mines. The trial at Landskrona was witnessed by officers representing every European power.

FOURTH CONGRESS OF GERMAN PHYSICIANS, 1885.

THE fact that some of the most important work in medical science is being done in Germany, and that at the congress, whose proceedings have been recently published,[1] some valuable additions to medical knowledge were made, warrants a notice in the columns of *Science*.

The first subject discussed by the congress was corpulence. Ebstein advanced the opinion that drugs were of little service in reducing the amount of fat, and that an entire change in the regimen—including both change of diet and of the manner of living—was necessary. Any method which reduced the general nutrition, and thus removed fat, was a failure: the fat alone must be removed. The method must not require the individual to give up his business during treatment, else it would not be generally applicable. The method must be capable of being continued indefinitely without producing unpleasant results, for individuals predisposed to corpulence by heredity or constitution must keep up the diet for a long time. One method is to cut off all fatty foods. But as carbohydrates may be changed into fat in the body, this is not reasonable. The object is rather to prevent the formation of fat in the body. To secure this, it is necessary to regulate the proportion of albuminous, starchy, and fatty foods, so that perfect nutrition shall be secured, but no excess of fat produced. The necessary amount of fat for a healthy man is 142 gr. per diem. If this is reduced one-half, a part of the amount necessary for nutrition will be taken from the body to compensate for the reduced allowance in the food, and thus the excess of fat may be removed. Under this system the individual does not suffer the distress which is felt by those who are cut off from all fatty food, and the results are more successful and agreeable than those secured by the Banting system. The amount of carbohydrates is to be reduced so that no surplus above bodily needs shall be taken. In the Banting system the diet is chiefly nitrogenous, which often causes indigestion. Ebstein gives nitrogenous food, with the reduced allowance of starch and fat in sufficient quantity to keep up the general nutrition and working strength, but not in such amounts as to overload and embarrass the organs which digest proteids. The necessity of muscular exercise of sufficient force to produce free perspiration is insisted upon. This system has met with approval in Germany on account of its success.

Henneberg, in discussing the subject, approached it from a different side, and, by a review of the methods adopted in fattening cattle, sought to deduce the rules necessary to be observed in avoiding the accumulation of fat in man. The general discussion elicited varying views upon the physiology of digestion, but all agreed that the use of medicine for reducing corpulence was to be avoided.

The discovery and demonstration by Lustgarten of a bacillus of syphilis has already been alluded to in *Science*.

Measures to be adopted in combating fever formed the topic of one day's discussion of the congress. The well known property of quinine in reducing fever has led to a search for similar properties in organic substances allied to it in chemical constituents. Benzol, carbolic and salicylic acids, salicin, resorcin, hydrochinon, chinolin, kairin, thallin and antipyrin are such substances, and they have all been found of use as antipyretics. Many of them have, however, unpleasant effects; so that, at present, salicin, kairin, and

[1] *Verhandlungen des congresses für innere medicin.* Vierter congress, 1885. Herausgegeben von Drs. E. Leyden und E. Pfeiffer.

antipyrin are the only ones in general use. Antipyretics may act either by reducing the production of heat, *i. e.*, the oxidation process; or by increasing the amount of heat given out from the body; or by paralysing certain micro-organisms whose action irritates the heat producing mechanism; or by restraining and regulating the action of these heat producing nervous mechanisms directly. It is to the latter theory that Filehne and Liebermeister assent. The latter, to whom is due the use of cold baths in the treatment of fever, admitted that antipyrin was applicable in some cases where the application of cold was unadvisable. But cold baths are not to be given up. A healthy man in a cold bath (68° F.) gives off in ten minutes seven times as much heat as under ordinary circumstances. But his body temperature remains the same. Therefore the effect of the bath is to increase seven times the production of heat in the body. If the bath is long continued the temparature falls slightly. After the bath the temperature falls slightly. The same is true in fever with this difference, that the fall of temperature follows a cold bath more quickly, and to a much greater degree than in health. In many cases this removal of heat by bath is indispensable, even though it is accompanied by an increase in the production of heat, for in fever experience shows that the amount abstracted exceeds the amount produced. According to v. Jaksch, thallin in 0.25 dose produces a fall of temperature more quickly than antipyrin in 1. dose. It is apt, however, to produce a chill and sweat, and its effect is not so lasting as that of antipyrin. Neither of them affects the duration of a specific fever (such as pneumonia or erysipelas), or relieve the distress of the patient. In pneumonia and erysipelas their use prolongs the period of convalescence by reducing the recuperative powers of the patient. They are, therefore, to be used only in cases of fever in which the temperature rises to a dangerous point, or in which cold bathing cannot be used. To this opinion Strümpell of Leipzig agreed. Others maintained that the reduction of temperature gave the patient much comfort, relieving many distressing symptoms. All agreed that the use of cold baths, or cold sponging, was preferable to the use of drugs.

Asthma was the subject of a long and exhaustive discussion, which elicited a number of subdivisions of the affection of some therapeutic importance. Asthma is regarded as a nervous affection, attended by a sudden obstruction to expiration, with dilatation of the lung. It may be a primary disease due to changes in the nervous centres governing respiration. In the majority of cases, however, it is a secondary disease of reflex origin. An irritation arising at some point sets up an excitement of the nervous mechanism of respiration, which shows itself by the attack. Such an irritation may come from the mucous membrane of the nose when that is thickened by chronic catarrh, or covered with polypi, or irritated by some external material, as in hay fever, in which case operative measures on the nasal cavity, or anæsthetics applied to it, will cure the asthmatic attacks. Or the irritation may come from the finer bronchi, and the inflammation of these may set up a spasm, and thus cause the attack, in which case the treatment must be directed toward the bronchitis. The exact character of the spasm attending the attack is undetermined. Some regard it as a spasm of the diaphragm, which prevents this muscle from relaxing, as it normally does, in expiration. This view is based upon the fact that electrical excitement of the nerves to the diaphragm will produce results similar to those occurring in asthma, while excitement of the nerves to the bronchial muscles does not produce asthma. The majority of authorities, however, consider this theory questionable, and hold that a true spasm of the muscular coat of the finer bronchi causes the attack. All admit that the spasm, from whatever cause, is best combated by narcotics, of which morphine and chloral are the most reliable. But treatment of the attack should always be followed by treatment of the cause, especially if that is easily reached, as in cases of nasal catarrh.

Acute articular rheumatism has lately been regarded as an acute infectious disease like pneumonia and typhoid fever. The opinion was advanced by Edlefsen that it developed in certain localities in Kiel more frequently than in others, and he found, in investigating 845 cases, that persons living in certain houses were especially liable to the disease. He concluded that the micro-organism causing the disease is one which clings to dwellings, especially such as are built on damp ground, and advises persons who are subject to frequent attacks to change their residence. Such authorities as Jurgensen and Friedländer agreed to this view, and in support of it cited the fact that in certain barracks and hospitals, cases of acute rheumatism developed in great numbers. All admitted that the mortality had diminished greatly since the use of salicylate of soda was introduced.

A number of shorter papers of value were read, which are not of such general interest as to demand notice. The proceedings of this congress should be followed by all physicians interested in the progress of scientific medicine.

M. A. S.